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## 2014

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### Group A:

Question: 1 ii – iii

### Group B:

Question: 2 iv – vi

### Group C:

Question: 3 vii– xiv

### Group D:

Question: 4 xiv- xvii

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## GROUP 'A'

### Question: 1

Answer the following questions: (Alternatives are to be noted):

[1x10=10]

a. What is Prophage?

#### Answer:

A prophage is a bacteriophage (often shortened to "phage") genome inserted and integrated into the circular bacterial DNA chromosome or existing as an extrachromosomal plasmid. This is a latent form of a phage, in which the viral genes are present in the bacterium without causing disruption of the bacterial cell.

b.

c. Choose the correct answer: Interfascicular cambium is a

- i. Primary meristematic tissue
- ii. One kind of protoderm
- iii. Primordial meristem
- iv. Secondary meristematic tissue

Or

#### Answer:

Primordial meristem.

What do you mean by stone cell?

#### Answer:

These cells are often called sclereids or even more complicated Sklerenchymzelle. Behind the cells that are already dead to hide. They may be present as so-called Isoblasten, which means that they are surrounded by cells that have a different structure and other features (not dead in this case).

d. Fill in the blank:

When a plant produces two types of leaves, then the phenomenon is called \_\_\_\_\_.

#### Answer:

Marble cancer.

Or

What is gynandrous stamen?

e. Write the scientific name of tiger prawn.

#### Answer:

Exhibiting characteristics of both feminine and masculine. Both denotational synonym and connotational antonym of androgynous.

The male reproductive organ of a flower. The male organ of angiosperm flowers where pollen grains are produced in the anther component of the stamen. These pollen grains are produced by meiosis and provide the building blocks required for reproduction of an angiosperm species.

f. Write the scientific name of the microbe responsible for peptic ulcer.

#### Answer:

g. Choose the correct answer: Pacemaker means



- 
- i. S.A.Node
  - ii. Bundle of His
  - iii. A.V.Node
  - iv. Purkinje fibres

**Answer:**

Purkinje fibres

- h. Mention the function of Bradykinin.

**Answer:**

Bradykinin is a potent endothelium-dependent vasodilator, leading to a drop in blood pressure. It also causes contraction of non-vascular smooth muscle in the bronchus and gut, increases vascular permeability and is also involved in the mechanism of pain.

Or

State the principal function of posterior hypothalamus in body temperature regulation.

**Answer:**

At an air temperature of +3°C the posterior hypothalamus temperature was altered between 28 and 42°C, while anterior hypothalamus temperature was kept close to its control level. Shivering and heat production decreased with cooling and increased with warming of the posterior hypothalamus.

- i. Mention the amount of tidal volume.

**Answer:**

Tidal volume is the lung volume representing the normal volume of air displaced between normal inhalation and exhalation when extra effort is not applied. In a healthy, young human adult, tidal volume is approximately 500 mL per inspiration or 7 mL/kg of body mass.

- j. Choose the correct answer: Which antibody is most abundant in our body?

- i. IgG
- ii. IgM
- iii. IgA
- iv. IgD

**Answer:**

IgG.

Or

Where are B-lymphocytes formed?

- k. Which lobe of the cerebrum is associated with vision?



## GROUP 'B'

### Question: 2

Answer the following questions? (Alternatives are to be noted):

[2x7=14]

a. Distinguish between offset and phylloclade.

#### Answer:

##### Offset – Characters:

Like runner but thicker and shorter, grow for a Water hyacinth, short distance then produce cluster (rosette) of water lettuce leaves above and adventitious roots below; generally in aquatic plants

Examples: Water hyacinth, water lettuce

##### Phylloclade - Characters:

Green, flattened or cylindrical fleshy stem, with Opuntia (prickly nodes and internodes; bears spines (modified pear) leaves to check evaporation); carries out photosynthesis, stores water. Found in plants growing in dry regions

Examples: Opuntia (prickly pear)

Or

b. Write the floral formula of Hibiscus rosa sinensis.

#### Answer:

Habit: Perennial shrub.

Root: Tap root system.

Stem: Aerial, erect, cylindrical, woody and branched

Leaf: Simple, Alternate, petiolate, stipulate, serrate, glabrous, apex acuminate with multicostate reticulate venation.

Inflorescence: Solitary cyme and axillary.

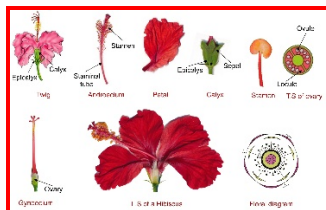
Flower: Pedicel jointed, bracteate, bracteolate, bisexual, large, showy, pentamerous, dichlamydeous, actinomorphic, complete and hypogynous and mucilage is present in floral parts.

Epicalyx: 5 to 8 bracteoles outer to the calyx. They are green and free.

Calyx: Sepals 5, green, gamosepalous showing valvate aestivation and odd sepal is posterior in position.

Corolla: Petals 5, variously coloured, polypetalous but fused at the base and showing twisted aestivation.

Androecium” Numerous stamens, monadelphous, filaments are fused to form a staminal tube around the style. Staminal tube is red. Anthers are monothecous, reniform, yellow, transversely attached to the filament, dehisce transversely and extrorse.



Or

State two advantages of micro-propagation in plant.

#### Answer:



- 
1. Requires relatively small growing space.
  2. The technique of micropropagation is applied with the objective of enhancing the rate of multiplication. Through tissue culture over a million plants can be grown from a small, even microscopic, piece of plant tissue within 12 months.
  3. Shoot multiplication usually has a short cycle (2-6 weeks) and each cycle results in logarithmic increase in number of shoots.

c. What do you mean by hypophysation?

**Answer:**

Hypophysation is presently the most commonly used method for the induced breeding of grass carp. In the hypophysation procedure pituitary extract is suspended in a physiological salt solution. The practice of injecting fish with substances derived from the pituitary gland for the purpose of inducing reproduction (such as ovulation) when conditions are not favourable for successful natural spawning in ponds.

d. State how fibrinogen is converted to fibrin polymer.

**Answer:**

The fibrin polymers formed in solution during the earliest phase of the fibrinogen–fibrin conversion are shown to be stable soluble molecules at pH7.4 and 0.15M- or 0.3M-NaCl. The various sequential soluble fibrin polymers produced from the fibrinogen–thrombin reaction can be observed by gel chromatography and can be isolated for characterization. The mechanism of fibrin polymerization proposed from the present studies suggests that the initial event is the thrombin activation at only one of the A $\alpha$ -chains in fibrinogen.

The resulting highly reactive intermediate is the true fibrin monomer and it rapidly, and irreversibly, self-associates to form the stable fibrin dimer ( $S_{20,w}=12S$ ). Fibrin dimer possesses the N-terminal pattern alanine/glycine/tyrosine (1:1:2) per 340000 molecular weight, and possesses the chain structure  $[(\alpha)A\alpha)(B\beta)_2(\gamma)_2]_2$ .

The fibrin dimer is a soluble inert molecule, but additional thrombin activation of its remaining intact A $\alpha$ -chains leads to new associations into larger inert soluble fibrin polymers.

Or,

Mention two main functions of tissue fluid.

**Answer:**

1. Tissue fluid, also known as interstitial fluid, is a thin layer of fluid that surrounds the body's cells. This fluid is used to monitor glucose levels. Cells that are suspended in tissue fluid are protected from damage that can be caused by the vibrations of an animal's movement. Tissue fluid also acts as a medium for sending chemical messages across cells.
2. Tissue fluid makes up about 40 percent of the water in the human body, which accounts for almost one-sixth of human body weight. This fluid is found in the interstitial, or tissue, spaces. Exchange of tissue fluid, gases, nutrients and wastes between the blood and body tissues takes place in the capillaries.

e. Why does cardiac muscle not fatigue?

**Answer:**

Cardiac muscle resists fatigue so well because it's got more mitochondria than skeletal muscle. With so many power plants at its disposal, the heart doesn't need to stop and chill out. It also has a steady supply of blood bringing it oxygen and nutrients.



f. Write two functions of autonomic nervous system.

**Answer:**

The autonomic nervous system controls the insides of the body: the viscera or gut. It carries information about the inside of the body to the CNS and controls the action of internal organs, including the gut, the heart, the secretion of epinephrine (adrenalin) and norepinephrine (noradrenalin) from the medulla (middle part) of the adrenal gland, etc.

The autonomic nervous system plays an essential role in keeping the body's internal environment (temperature, salt concentration, blood sugar, oxygen and carbon dioxide level in blood, etc) in proper balance, a condition called homeostasis. The autonomic nervous system also plays a major part in emotional experience and expression.

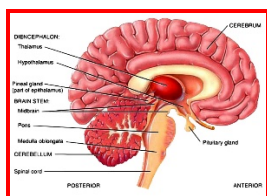
Or,

Mention the functions of pons or thalamus.

**Answer:**

Besides the medulla oblongata, your brainstem also has a structure called the pons. The pons is a major structure in the upper part of your brain stem. It is involved in the control of breathing, communication between different parts of the brain, and sensations such as hearing, taste, and balance.

The thalamus is a small structure within the brain located just above the brain stem between the cerebral cortex and the midbrain and has extensive nerve connections to both. The main function of the thalamus is to relay motor and sensory signals to the cerebral cortex.



g. Write two abnormal constituents of urine. What is diabetes insipidus?

**Answer:**

**Albumin:**

Albumin is a type of protein, which is a normal component of plasma—the fluid component of blood. When albumin is found to be excessive in the urine, it may indicate that the tiny filtering units in the kidney, called nephrons, are damaged or destroyed. Elevated albumin in the urine is termed albuminuria.

**Bilirubin:**

Bilirubin, when modified by the kidneys, contributes to the classical yellow color of urine. It is a byproduct that results from the breakdown of hemoglobin—the red pigment in red blood cells. When levels of bilirubin in urine is above normal, the condition is called bilirubinuria. This may indicate liver disease or obstructive biliary disease.

Diabetes insipidus occurs when the body can't regulate how it handles fluids. The condition is caused by a hormonal abnormality and isn't related to diabetes.



## GROUP 'C'

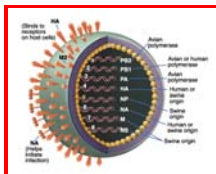
### Question: 3

Answer the following questions? (Alternatives are to be noted):

[4x11=44]

- a. Write one characteristic each from outer covering and genome of influenza virus. What do you mean by lysogenic cycle? [2x2=4]

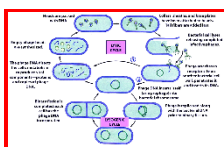
### Answer:



The influenza virion (as the infectious particle is called) is roughly spherical. It is an enveloped virus – that is, the outer layer is a lipid membrane which is taken from the host cell in which the virus multiplies. Inserted into the lipid membrane are 'spikes', which are proteins – actually glycoproteins, because they consist of protein linked to sugars – known as HA (hemagglutinin) and NA (neuraminidase). These are the proteins that determine the subtype of influenza virus (A/H1N1, for example).

We'll discuss later how the HA and NA are given subtype numbers. The HA and NA are important in the immune response against the virus; antibodies (proteins made by us to combat infection) against these spikes may protect against infection. The NA protein is the target of the antiviral drugs Relenza and Tamiflu. Also embedded in the lipid membrane is the M2 protein, which is the target of the antiviral adamantanes – amantadine and rimantadine.

Lysogeny is characterized by integration of the bacteriophage nucleic acid into the host bacterium's genome or formations of a circular replicon in the bacterium's cytoplasm.



Or

Classify bacteria in a tubular form on the basis of their nutrition types with example.

[4]

### Answer:

Every organism must find in its environment all of the substances required for energy generation and cellular biosynthesis. The chemicals and elements of this environment that are utilized for bacterial growth are referred to as nutrients or nutritional requirements. Many bacteria can be grown in the laboratory in culture media which are designed to provide all the essential nutrients in solution for bacterial growth. Bacteria that are symbionts or obligate intracellular parasites of other cells, usually eucaryotic cells, are (not unexpectedly) difficult to grow outside of their natural host cells. Whether the microbe is a mutualist or parasite, the host cell must ultimately provide the nutritional requirements of its resident.

Many bacteria can be identified in the environment by inspection or using genetic techniques, but attempts to isolate and grow them in artificial culture has been unsuccessful. This, in part, is the basis of the estimate that we may know less than one percent of all procaryotes that exist.



- 
- b. What do you mean by 'annual ring'? Distinguish between racemose and cymose inflorescence.

[2+2=4]

**Answer:**

A new layer of wood is added in each growing season, thickening the stem, existing branches and roots, to form a growth ring. Growth rings, also referred to as tree rings or annual rings, can be seen in a horizontal cross section cut through the trunk of a tree.

Or

Briefly describe the structure of sieve tube. Write the importance of fruit and seed dispersal.

[2+2=4]

**Answer:**

The main function of the sieve tube is transport of carbohydrates, primarily sucrose, in the plant (e.g., from the leaves to the fruits and roots). Unlike the water-conducting xylem vessel elements that are dead when mature, sieve elements are living cells. They are unique in lacking a nucleus at maturity.

After fertilization, seeds will form. It is important for the seeds to be spread (dispersed) away from each other and from the parent plant. This helps to avoid overcrowding and the competition for light, water and mineral salts that would result. Dispersal also enables species to take advantage of new opportunities and to survive if conditions for the parent plant become unsuitable.

Plants have a variety of ways in which they disperse their seeds, or the fruits containing the seeds. Four main groups of dispersal mechanisms can be recognized: animal, wind, water and self-dispersal. The size, shape and color of the fruit and seed, together with other features, reflect the method of dispersal.

- c. Mention two major differences between senescence and ageing. Give the example of a short-day plant and day-neutral plant.

[2+2=4]

**Answer:**

During ageing, the brain loses some cells and others (neurons) are damaged. There is a decline in the muscle mass. Moreover programmed senescence theory,

Ageing is the result of sequential switching on and off of certain genes causing programmed cell death or apoptosis. The number of mitochondria in the cells decreases.

Example: poinsettias, Easter lilies

Example: radishes, lettuce.

- d. Mention four contrasting characteristics of Hemichordata and Cephalochordata.

[4]

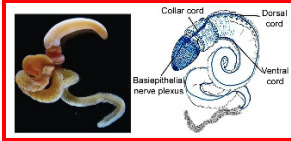
**Answer:**

**Hemichordate:**

The Hemichordata are soft-bodied, worm-like marine organisms which are often found in U-shaped burrows on sandy or muddy sea bottoms. The Hemichordata share characteristics with both the Chordata (their name means "half" - chordate) and the echinoderms.

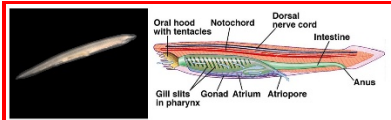






### **Cephalochordata:**

The characteristics of Cephalochordata are that they are marine animals, segmented, and that they possess elongated bodies with a notochord that extends the length of the body and cirri surrounding the mouth for obtaining food.



Or,

Write two main characteristics of the phylum Echinodermata.

### **Answer:**

#### **Characteristics of Echinoderms**

Echinoderms are characterized by radial **symmetry**, several arms (5 or more, mostly grouped 2 left - 1 middle - 2 right) radiating from a central body (= pentamerous). The body actually consists of five equal segments, each containing a duplicate set of various internal organs.



e. Mention the animal phyla/classes in which the following characteristics are found:

$$[2 + \left(\frac{1}{2} \times 4\right) = 4]$$

- i. Diaphragm
- ii. Veliger larva
- iii. The bone called Keel
- iv. The colloblast cell

### **Answer:**

#### **Diaphragm :**

The **diaphragm** is the main inspiratory muscle, accounting for more than 50% of the tidal volume during quiet breathing. It works continuously, contracting rhythmically and generally at a low intensity.

#### **Veliger larva :**

A veliger is the planktonic larva of many kinds of sea snails and freshwater snails, as well as most bivalve molluscs (clams) and tusk shells.

#### **The bone called Keel:**

A keel or carina (plural carinae) in bird anatomy is an extension of the sternum (breastbone) which runs axially along the midline of the sternum and extends outward, perpendicular to the plane of the ribs.



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**The colloblast cell :**

Colloblasts are a cell type found in ctenophores. They are widespread in the tentacles of these animals and are used to capture prey. Colloblasts consist of a coiled spiral filament that is embedded in the epidermis and an axial filament with a granular dome.

- f. Explain briefly the mode of infection of malarial parasite in human. What is vector? [3+1=4]

**Answer:**

The natural ecology of malaria involves malaria parasites infecting successively two types of hosts: humans and female *Anopheles* mosquitoes. In humans, the parasites grow and multiply first in the liver cells and then in the red cells of the blood. In the blood, successive broods of parasites grow inside the red cells and destroy them, releasing daughter parasites ("merozoites") that continue the cycle by invading other red cells.

The blood stage parasites are those that cause the symptoms of malaria. When certain forms of blood stage parasites ("gametocytes") are picked up by a female *Anopheles* mosquito during a blood meal, they start another, different cycle of growth and multiplication in the mosquito.

After 10-18 days, the parasites are found (as "sporozoites") in the mosquito's salivary glands. When the *Anopheles* mosquito takes a blood meal on another human, the sporozoites are injected with the mosquito's saliva and start another human infection when they parasitize the liver cells.

Thus the mosquito carries the disease from one human to another (acting as a "vector"). Differently from the human host, the mosquito vector does not suffer from the presence of the parasites.

Or

Write the scientific names of the parasite causing sleeping sickness and Kala-azar. What are the names of infective stage of pathogen of Ascariasis and Filaria diseases? [2+2=4]

**Answer:**

Scientific names of the parasite causing sleeping sickness - Trypanosomiasis

Scientific names of the parasite causing Kala-azar - Visceral leishmaniasis

The names of infective stage of pathogen of Ascariasis - *Lumbricoides*

The names of infective stage of pathogen of Filaria diseases - Elephantiasis

- g. What do you mean by a pest? Briefly describe the nature of damage caused by a mammalian pest. [1+3=4]

**Answer:**

A pest is "a plant or animal detrimental to humans or human concerns (as agriculture or livestock production)"; alternative meanings include organisms that cause nuisance and epidemic disease associated with high mortality (specifically: plague). In its broadest sense, a *pest* is a competitor of humanity.

Pests which can destroy cotton balls include insects belonging to family lepidopterans (tobacco budworm, armyworm), coleopterans (beetles) and dipterans (flies, mosquitoes). *Bacillus thuringiensis* a bacterium which possess Bt genes which is very toxic insecticidal protein (produced at specific phase or there life cycle) and have the property to kill pest so it is designated as biopesticide.

This protein is secreted as protoxin (inactive form), once it is ingested by the pest it gets into the gut of pest where the pH acts as a catalyst for conversion protoxin to active toxin. The activated toxin binds to the surface of midgut epithelial cells and creates pores that cause cell swelling and lysis and eventually cause death of the insect.



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The toxin is coded by a gene named cry. There are a number of them, for example the proteins encoded by the gene cryIAC and cryIIAb control the cotton bollworms that of cryIAb control corn borer. Specific Bt toxin genes were isolated from *Bacillus thuringiensis* and incorporated into the several crop plants such as Bt cotton, Bt corn, rice, tomato, potato and soybean etc.

Or

Write the scientific names of two Exotic carps. What gill-rot disease of fishes?

[2+2=4]

**Answer:**

The scientific names of two Exotic carps are *Hypophthalmichthys molitrix* and *Carassius carassius*

It is a fungal disease involving gill tissues, affecting the most species of freshwater fish. The disease is caused by *Branchiomyces sanguine* and *Branchiomyces demigrans*. It is characterized by areas of infective necrosis of the gills, anorexia, and marbling appearance of the gills.

h. Name the important constituents of honey. Mention the of Muscardine disease.

[2+2=4]

**Answer:**

Fructose and glucose are the important constituents of honey.

Muscardine is a disease of insects. It is caused by many species of entomopathogenic fungus. Many muscardines are known for affecting silkworms. Muscardine may also be called calcino. While studying muscardine in silkworms in the 19th century, Agostino Bassi found that the causal agent was a fungus.

Or

What are 'diapause' and 'voltinism'? Write the names of two laying breeds and two table breeds of poultry birds.

[1+1+1+1=4]

**Answer:**

Diapause is a suspension of development that can occur at the embryonic, larval, pupal, or adult stage, depending on the species. In some species, diapause is facultative and occurs only when induced by environmental conditions; in other species the diapause period has become an obligatory part of the life cycle.

Voltinism is a term used in biology to indicate the number of broods or generations of an organism in a year. The term is most often applied to insects, and is particularly in use in sericulture, where silkworm varieties vary in their voltinism.

Two laying breeds of poultry birds - Rhode Island Red, Ancona.

Two table breeds of poultry birds - Ducks, geese.

i. Write the importance of respiratory quotient. What do you mean by 'biological value' and 'nutritional value' of protein?

[1+3=4]

**Answer:**

The respiratory quotient (or RQ or respiratory coefficient), is a dimensionless number used in calculations of basal metabolic rate (BMR) when estimated from carbon dioxide production. Such measurements, like measurements of oxygen uptake, are forms of indirect calorimetry. It is measured using a respirometer.

Biological value (BV) is a measure of the proportion of absorbed protein from a food which becomes incorporated into the proteins of the organism's body. It captures how readily the digested protein can be used in protein synthesis in the cells of the organism.



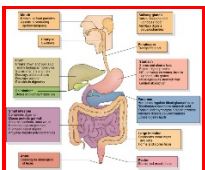
Nutrition Value: the study of nutrients in food, how the body uses nutrients, and the relationship between diet, health and disease. Major food manufacturers employ nutritionists and food scientists.

Or

Outline the digestion of protein in a tubular form. Where is Brunner's gland located? [3+1=4]

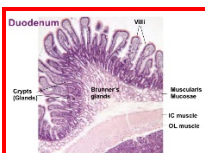
**Answer:**

Digestion begins even before you put food into your mouth. When you feel hungry, your body sends a message to your brain that it is time to eat. Sights and smells influence your body's preparedness for food. Smelling food sends a message to your brain. Your brain then tells the mouth to get ready, and you start to salivate in preparation for a delicious meal.



Digestion converts the food we eat into smaller particles, which will be processed into energy or used as building blocks.

(Duodenal glands in submucosa are labeled at right, fourth from the top.) Brunner's glands (or duodenal glands) are compound tubular submucosal glands found in that portion of the duodenum which is above the hepatopancreatic sphincter (aka sphincter of Oddi).



- j. Mention any four factors influencing blood pressure. Write the importance of physiological dead space. [2+2=4]

**Answer:**

1. Blood Pressure Cuff is too Small - It is extremely important to make sure the proper size blood pressure cuff is used on your upper arm when taking a measurement. In fact, most blood pressure measurement errors occur by not taking the time to determine if the patient's arm circumference falls within the Range indicators on the cuff. Studies have shown that using too small of a blood pressure cuff can cause a patient's systolic blood pressure measurement to increase 10 to 40 mmHg.
2. Blood Pressure Cuff Used Over Clothing- When having your blood pressure measured, the cuff should always be placed directly on your arm. Studies have shown that clothing can impact a systolic blood pressure from 10 to 50 mmHg.
3. Not Resting 3-5 minutes- To obtain an accurate blood pressure measurement, it is important that you relax and rest quietly in a comfortable chair for 3 to 5 minutes before a reading is taken. Any activities such as exercise or eating can affect your systolic blood pressure measurement 10 to 20 mmHg.
4. Arm/Back/Feet Unsupported- When having your blood pressure measured, you should always be seated in a comfortable chair, legs uncrossed, with your back and arm supported. If your back is not supported, your diastolic blood pressure measurement may be increased by 6 mmHg. Crossing your legs has shown to raise your systolic blood pressure by 2 to 8 mmHg. The positioning of your upper arm below your heart level will also result in higher



measurements, whereas positioning your upper arm above your heart level will give you lower measurements. These differences can increase/decrease your systolic blood pressure 2mmHg for every inch above/below your heart level.

**Physiological dead space:**

The volume occupied by gas which does not participate in gas exchange in lung. A few different types, including:

1. anatomical dead space
2. physiological dead space
3. alveolar dead space
4. apparatus dead space

Or

How is cardiac output measured using Fick's principles. What do you mean by 'mountain sickness' or 'acclimatization'. [2+2=4]

**Answer:**

The saturation of mixed venous blood is approximately 75% in health. Using this value in the above equation, the oxygen concentration of mixed venous blood is approximately 150 ml of O<sub>2</sub> per litre. Cardiac output may also be estimated with the Fick principle using production of carbon dioxide as a marker substance.

Acute Mountain Sickness (AMS) AMS is common at high altitudes. At elevations over 10,000 feet (3,048 meters), 75% of people will have mild symptoms. The occurrence of AMS is dependent upon the elevation, the rate of ascent, and individual susceptibility.

Or,

- k. Distinguish between active immunity and passive immunity. Mention the name and one function of the main hormone secreted from testes. [2+2=4]

**Answer:**

Active immunity	Passive immunity
1. It is developed when the person's own cells produce antibodies in response to infection or vaccine.	1. It is developed when antibodies produced in other organisms are injected into a person to counter act antigen such as snake venom.
2. It provides relief only after long period.	2. It provides immediate relief.
3. It has no side effects.	3. It may cause reaction.
4. It is long lasting.	4. It is not long lasting.

- l. Describe briefly the histological structure of testis with labelled diagram. [4]

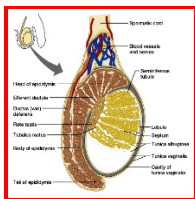
**Answer:**

Each testis is covered by a layer of fibrous connective tissue Tunica albuginea. Internally it consists of a number of convoluted tubular structures called seminiferous tubules. Each tubule is lined by germinal epithelium and contains germ cells at different stages of maturation → spermatogonia → spermatocytes → spermatids → spermatozoa.

Besides there are some elongated supporting cells called sertoli cells which provide nutrition to sperms. The tubules are separated from each other by connective tissue stroma, which contains groups of large, polyhedral cells called interstitial cells of Leydig or Leydig cells which secrete male sex hormones testosterone.

Several seminiferous tubules unite to form straight tubules which join in an irregular manner to form a network like structure called rete testis. Testis also secretes male hormone testosterone.





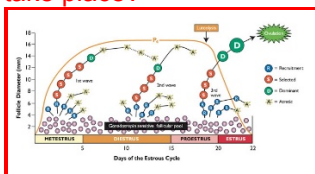
Or

What is 'Estrus cycle? In which stage of the embryo in which layer of the uterus does implantation take place?

**Answer:**

The estrous cycle is the main reproductive cycle of other species females of non-primate vertebrates, for example rats, mice, horses, pig have this form of reproductive cycle. Also do not confuse with "estrus", which is a phase of the cycle.

What is 'Estrus cycle? In which stage of the embryo in which layer of the uterus does implantation take place?



During mammalian development, the time during which a young animal grows inside its mother is known as gestation. We all know that a human baby grows inside of the mother's uterus for a period of time - about 9 months - and that it has years of development ahead of it following birth. But what actually occurs during gestation?

There are three general phases of gestation. The germinal stage is the period of gestation from fertilization or conception, when the egg meets the sperm, to implantation of the embryo in the uterus. The embryonic stage of gestation is the period after implantation, during which all of the major organs and structures within the growing mammal are formed.

Once the embryo is fully formed, it expands, grows, and continues to develop in what is known as the fetal development stage. This is when the mother becomes physically enlarged and visibly pregnant! The fetal development stage concludes at birth.

The following are major events during the embryonic stage of gestation.

**GROUP 'D'**

Answer the following questions? (Alternatives are to be noted):

[6x2=12]

**Question: 4**

- Mention the steps of  $C_4$  pathway with the help of word diagram in brief. What is the full form of RUBISCO? What is photophosphorylation?

[4+1+1=6]

**Answer:**

A  $C_4$  plant sounds like something that should be associated with Hollywood action movies! However, it is just a type of plant that uses a specific photosynthesis mechanism ( $C_4$  photosynthesis) in order to avoid photorespiration. Photorespiration is a wasteful reaction that

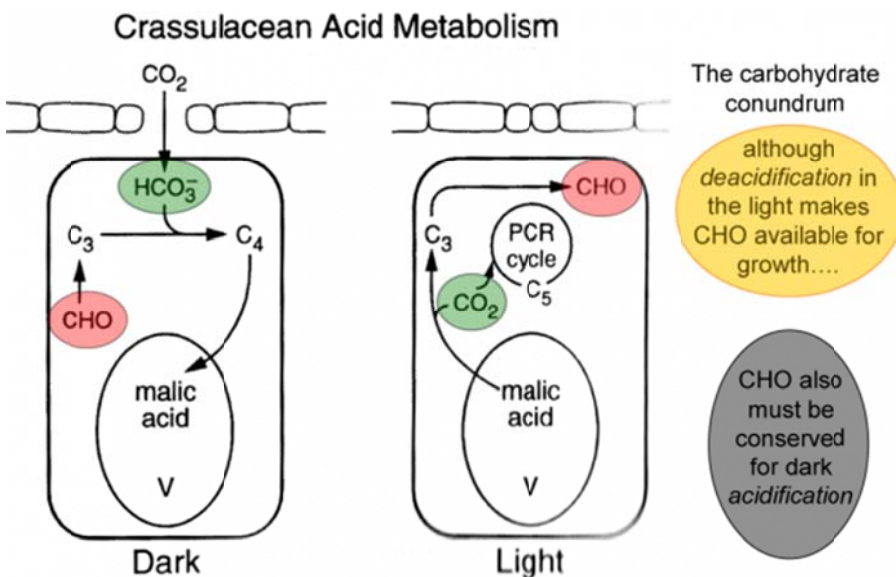


occurs when plants take in oxygen and give out carbon dioxide instead of taking in carbon dioxide and releasing oxygen.

All plants make energy during the Calvin cycle (the process where plants take up CO<sub>2</sub> and turn it into sugar energy); however, in hot, sunny, dry climates, C<sub>4</sub> plants are much more efficient than C<sub>3</sub> plants (plants that perform C<sub>3</sub> photosynthesis - the most common type).

The difference between C<sub>3</sub> and C<sub>4</sub> plants is that C<sub>4</sub> plants make a four-carbon sugar during the Calvin cycle instead of two three-carbon sugars as in C<sub>3</sub> plants. This larger sugar in C<sub>4</sub> plants brings more CO<sub>2</sub> to the RuBisCO enzyme, reducing oxygen levels and making the process energy-intensive. More CO<sub>2</sub> is brought into the process because of how cells are located.

C<sub>4</sub> plants like very sunny areas with warm temperatures. They can withstand cool evening temperatures.



**Ribulose-1,5-bisphosphate carboxylase/oxygenase**

In the process of photosynthesis, the phosphorylation of ADP to form ATP using the energy of sunlight is called photophosphorylation. Only two sources of energy are available to living organisms: sunlight and reduction-oxidation (redox) reactions.

OR

Mention four major differences in photosynthesis occurring in bacteria and green plants. Mention the differences between PS-I and PS-II. [4+2=6]

**Answer:**

**Differences in photosynthesis occurring in bacteria and green plants.**

1. Plants contain definite chloroplasts	1. Bacteria lack definite chloroplasts
2. In plants photosynthesis, the pigments involved are chlorophylls, caretonoids and phycobilins	2. In bacterial photosynthesis, the pigments involved are bacterio-chlorophylls, bacterioviridin and open chain aliphatic carotenoids.
3. It takes place at wavelengths between 400 to 700 mμ	3. It takes place at wavelengths above 700 mμ
4. The CO <sub>2</sub> reductants is NADPH + H <sup>+</sup>	4. The reductants is NADH + H <sup>+</sup>
5. The electron donor in this is only H <sub>2</sub> O	5. The electron donors in this are H <sub>2</sub> S, inorganic compounds and reduced organic



	compounds
6. Oxygen is evolved	6. Oxygen is not evolved
7. Two pigment systems are involved	7. It involves only one pigment system
8. The reaction centre of PS I is P700 and of PS II is P673 or P680	8. The reaction centre is only P890
9. Non cyclic photophosphorylation is dominant	9. Cyclic photophosphorylation is dominant
10. Emerson's enhancement effect occurs.	10. Emerson's enhancement effect occurs is not reported.

#### Differences in photosystem I and Photosystem II

1. PS I is located at the outer surface of the grana thylakoid membrane.	1. PS II is located at the inner surface of the grana thylakoid membrane.
2. The photocentre is P700.	2. The photocentre is P680.
3. Pigments absorb longer wavelengths of light (>680).	3. Pigments absorb shorter wavelengths of light (<680).
4. Participates in cyclic as well as non cyclic photophosphorylation.	4. Participates only in non cyclic photophosphorylation.
5. It is not associated with photolysis of water.	5. It is associated with photolysis of water.
6. Main function is ATP synthesis.	6. Main functions are ATP synthesis and hydrolysis of water.

Or

Draw a labelled diagram of the male reproductive system of Guinea pig. Name the muscular parts present in the posterior legs of guinea pig. [4+2=6]

#### Answer:

It consists of

- Testes, the primary sex organs and accessory sex organs.
- Reproductive tract: Epididymis, Vasdeferens, Ejaculatory duct and urethra.
- Accessory sex glands: Seminal vesicle, prostate and Cowper's gland.
- Male external genitalia or penis.

Paired testes are oval bodies surrounded by a sac called scrotum outside the body cavity hanging in between the root of penis and the junction of two legs. Scrotum keeps the temperature (30C – 40C) below the body temperature, which is essential for spermatogenesis.

Each testis remains suspended by a spermatic cord through which blood vessels, lymph and nerves enter into the testis.

From each testis emerge a number of small narrow ducts called efferent ductules or vasa efferentia, which join to form a highly convoluted tubular structure the epididymis. It is 6m. long and stores sperms.

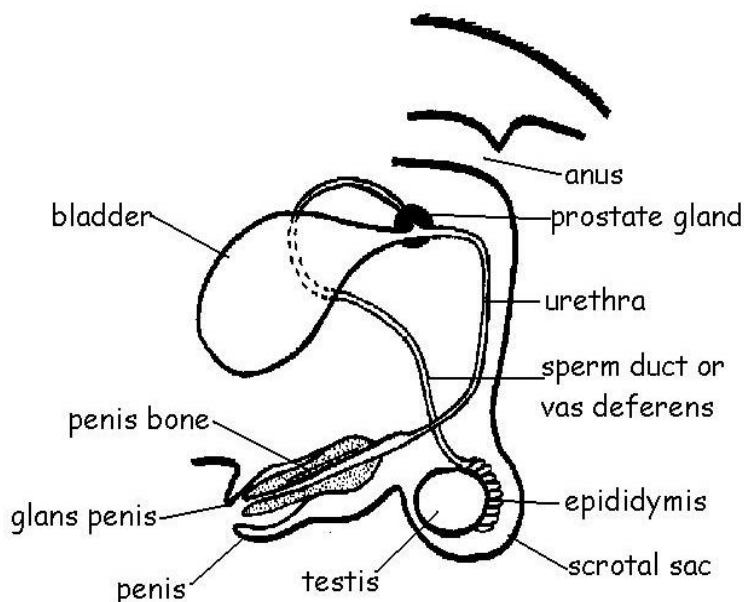
The epididymis leads into a muscular tube, the vas deferens. These carry the sperms. Two vasa efferentia each from either side unite to form the ejaculatory duct which opens into the proximal part of urethra. Urethra is 7-9 inches long. It passes through penis and opens at its tip.

The accessory glands pour their secretions into the ejaculatory ducts through short ducts; two seminal vesicles open into the ejaculatory duct before it enters into the single prostate gland located at the base of urinary bladder.

On emerging from prostate gland urethra receives two ducts coming from the bilateral Cowper's gland, just below prostate gland; then it passes through the muscular penis. The secretions of these glands form whitish semi fluid called semen. The tip of the penis is called glans penis and is covered by a fold of skin called prepuce.







Guinea pigs, like chinchillas, are hystricognath rodents. They belong to the family Caviidae, which contains 14 species of animals commonly known as cavies and Patagonian hares (or maras). Four digits on the forepaw and three on the hindfoot characterize Caviidae. A stocky build, large head, short legs, and unfurred, short ears characterize guinea pigs. Head and body length is 200–400 mm, there is no external tail, and weight is 500–1,500 g.

Or,

What do you mean by coprophagy? Name the salivary glands and their location in guinea pig. What is the type of portal found in guinea pig? Name the artery supplying blood to the diaphragm in guinea pig. [2+2+1+1=6]

**Answer:**

**coprophagy** The ingestion of faeces as a means of obtaining nutrients. Coprophagous animals include dung beetles, which eat cow dung, and rabbits, which ingest their own faeces. "coprophagy."

Health problems among guinea pigs that live alone are usually related to aging, dental disease, reproductive disorders, injury, or improper care. Infectious diseases such as certain viruses and bacteria usually occur only in guinea pigs that live with other guinea pigs. Intestinal parasites are not common.

Tumors are rare in young guinea pigs, but are more common in guinea pigs that are more than 5 years old. Treatment of infectious diseases can be complicated by the fact that guinea pigs are more sensitive to antibiotics than other types of pets.

